

SRF005 ULTRASONIC RANGE SENSOR

Specification:

The SRF005 ultrasonic range sensor detects objects in its path and can be used to calculate the range to the object. It is sensitive enough to detect a 3cm diameter broom handle at a distance of over 3m.

Voltage	- 5V
Current	- 30mA Typ. 50mA Max.
Frequency	- 40KHz
Max Range	- 3 m
Min Range	- 3 cm
Sensitivity	- Detect 3cm diameter broom handle at > 3 m
Input Trigger	- 10uS Min. TTL level pulse
Echo Pulse	- Positive TTL level signal, width proportional to range.
Small Size	- 43mm x 20mm x 17mm height

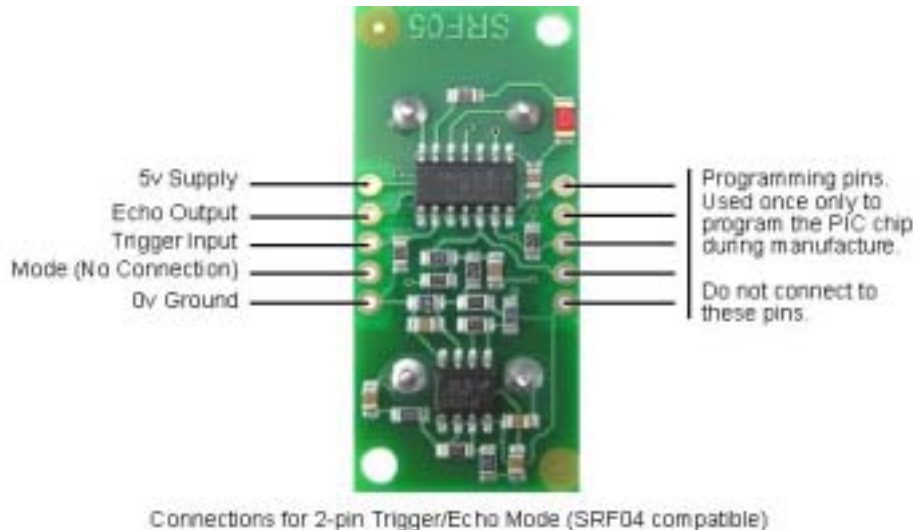


The module can be used in two different modes:

- Mode 1 - Separate PICAXE microcontroller trigger and echo pins
- Mode 2 - Single microcontroller pin (08M, and all M2 and X2 parts)

Mode 1 - separate trigger / echo microcontroller pins:

The SRF005 ultrasonic range finder has 5 connections pins. The power supply is connected to the 5V and 0V ground connections on the SRF005.



Note that on version 2 'blue colour' SRF005 modules the second set of unused pins has been removed.

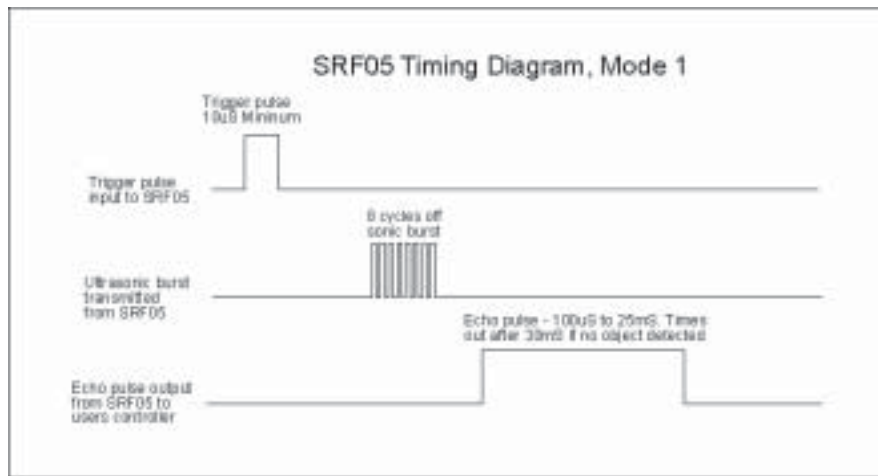
Important - Note that the 'Mode' (hole 4) connection **MUST NOT** be connected for correct operation in this separate trigger/echo mode.

Take care not to overheat, and therefore damage, the solder connection pads whilst making connections.

The SRF005 **Echo Output** is connected to a PICAXE **input** pin.

The SRF005 **Trigger Input** is connected to a PICAXE **output** pin. Note this must be a direct connection to the PICAXE chip leg (do not connect via a darlington driver buffered output on a project board).

Dual Pin Operation with the PICAXE microcontroller:



The following program gives an example of how to use the SRF005 module with a PICAXE microcontroller. Output 3 is used to trigger the SRF005 module via a 'pulsout' command. The SRF005 module then sends out the sonic burst, and sets the Echo Output connection high for the time it takes the sonic burst to be returned. Therefore the PICAXE input (input 6) is used to receive and time this echo pulse via a 'pulsin' command.

The length of the echo pulse is then divided by 5.8 to give a value in cm, and displayed on the computer screen via the 'debug' command. Note that a word variable, w1, is used for the echo timing, as the echo pulse may be a value greater than 255 (maximum value of a byte variable). Word variables are made up of two byte variables and so have a maximum value of 65535 (in this case w1 is made up of b2 and b3, so these two byte variables must not be used anywhere else in the program).

Sample Mode 1 PICAXE Program:

```

symbol trig = 3          ' Define output pin for Trigger pulse (A, M, X, X1 parts)
; symbol trig = b.3       ' Define output pin for Trigger pulse (M2, X2 parts)
symbol echo = 6          ' Define input pin for Echo pulse (A, M, X, X1 parts)
; symbol echo = c.6       ' Define input pin for Echo pulse (M2, X2 parts)
symbol range = w1        ' 16 bit word variable for range

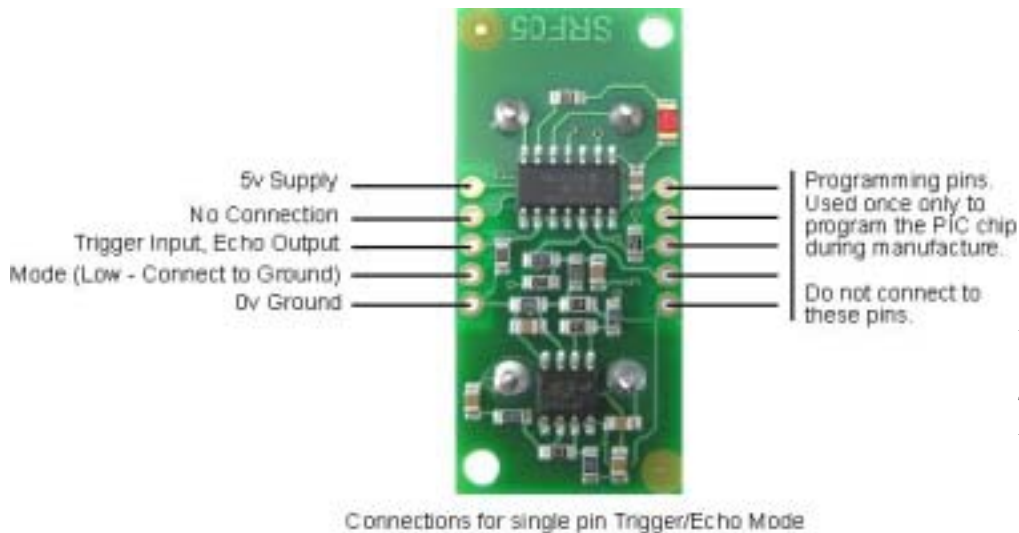
main:
    pulsout trig,2       ' produce 20µs trigger pulse (must be minimum of 10µs)
    pulsin echo,1,range  ' measures the range in 10µs steps
    pause 20             ' recharge period after ranging completes
    ' now convert range to cm (divide by 5.8) or inches (divide by 14.8)
    ' as picaxe cannot use 5.8, multiply by 10 then divide by 58 instead
    let range = range * 10 / 58    ' multiply by 10 then divide by 58
    debug range            ' display range via debug command
    goto main            ' and around forever

' Note that X2 parts operate at 8MHz instead of 4MHz and so modify the calculation
' let range = range * 10 / 58 / 2 ' multiply by 10 then divide by 58 then divide by 2

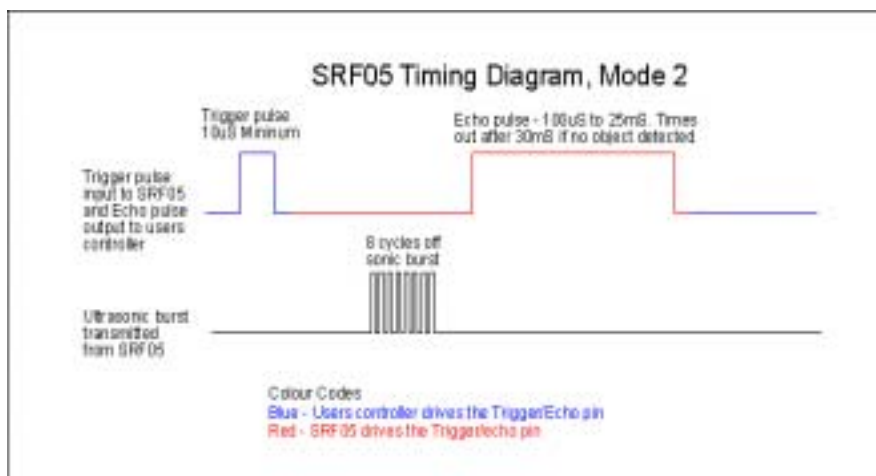
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Mode 2 - Single pin (for use with PICAXE with bidirectional pins):

The PICAXE-08M and all M2/X2 parts have bi-directional pins, so the SRF005 has a special mode for use with these chips. In this mode a single pin is used for both input and output.



Note that on version 2 'blue colour' SRF005 modules the second set of unused pins has been removed.



The following program gives an example of how to use the SRF005 module with a PICAXE microcontroller. In/Out pin 1 is used to trigger the SRF005 module via a 'pulsout' command and then the pin is converted to an input. The SRF005 module then sends out the sonic burst, and sets the pin high for the time it takes the sonic burst to be returned. Therefore the same PICAXE pin is then used to receive and time this echo pulse via a 'pulsin' command.

The length of the echo pulse is then divided by 5.8 to give a value in cm, and displayed on the computer screen via the 'debug' command. Note that a word variable, w1, is used for the echo timing, as the echo pulse may be a value greater than 255 (maximum value of a byte variable). Word variables are made up of two byte variables and so have a maximum value of 65535 (in this case w1 is made up of b2 and b3, so these two byte variables must not be used anywhere else in the program).

Sample Mode 2 PICAXE Program:

```

symbol trig = 1          ' Define pin for Trigger & Echo (08, 08M)
; symbol trig = C.1       ' Define pin for Trigger & Echo (All M2, X2 parts)
symbol range = w1        ' 16 bit word variable for range

main:
    pulsout trig,2        ' produce 20uS trigger pulse (must be minimum of 10uS)
    pulsins trig,1,range  ' measures the range in 10uS steps
    ' now convert range to cm (divide by 5.8) or inches (divide by 14.8)
    ' as picaxe cannot use 5.8, multiply by 10 then divide by 58 instead
    let range = range * 10 / 58 ' multiply by 10 then divide by 58
    debug range           ' display range via debug command
    pause 50             ' short delay
    goto main            ' and around forever

' Note that X2 parts operate at 8MHz instead of 4MHz and so modify the calculation
' let range = range * 10 / 58 / 2 ' multiply by 10 then divide by 58 then divide by 2

```

Sample Logicator Flowchart (Modes 1 and 2):

With the Logicator flowcharting software the special SRF005 dedicated 'ultra' command cell is used. This command will automatically select single pin mode for 08, 08M, all M2 and all X2 parts, and dual pin mode for all other PICAXE parts. The command also calculates all the mathematics automatically, so that the number returned in the variable is the exact distance in cm.

The following flowchart uses the debug command to demonstrate the SRF005 is working correctly. The distance (0-255 cm) should be displayed in the debug window once per second.

